Understanding Risk Balkans Conference, Belgrade, Serbia, September 17-19, 2018

Implementation in Poland of the European Union Flood Directive on the Assessment and Management of Floods – pros and cons

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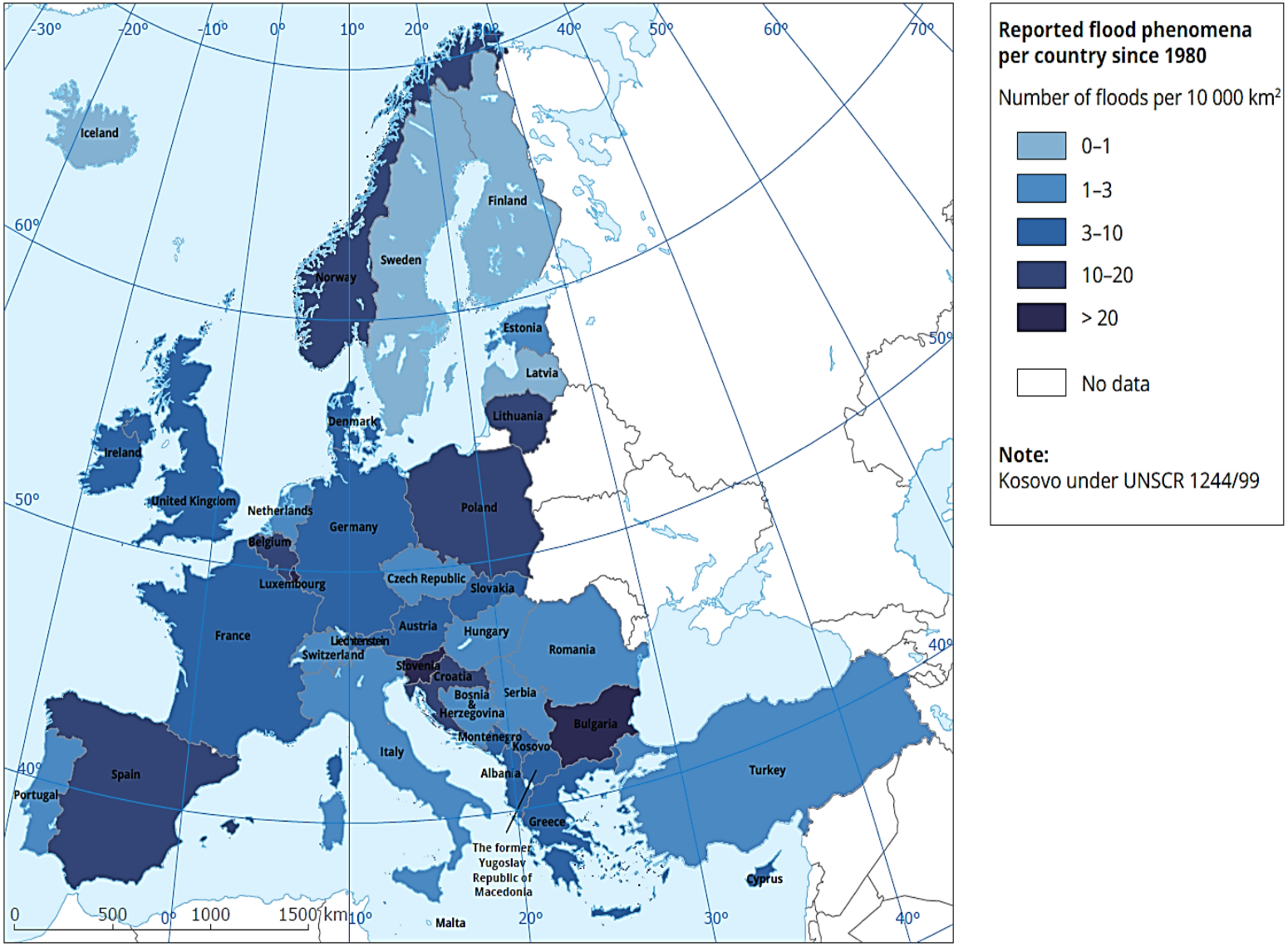
Reported flood phnenomena (numer of floods per 10 000 km) per country (since 1980)



Source: Flood risk and environmental vulnerability, EEA Report 1/2016

The 1997 flood
Odra & Vistula river

POLAND:

54 human lives;

680,000 homes, 143,000 enterprises, 4,000 education, culture and health care institutions were affected;

flood losses approx. $3.5 billion

CZECH REPUBLIC

flood losses approx. €550 million

GERMANY

flood losses approx. €330 million

1997 Flood on Odra River, Wroclaw, Poland

Flood on Warta River, a polder at Noteć River mouth

Phot. T.Konieczny

European Directive on the Assessment and Management of Floods

- creation, within the territory of the European Community, a uniform basis for taking action designed to reduce the risk of flooding
- harmonised with the WFD 2000/60/EC
- based on DPSIR (Driver-Pressure-State-Impact-Response) analysis
- adequate level protection for each basin
- investment activities should be linked to spatial development planning and preventive risk management
- Member States prepare **flood maps** , **indicative flood damage maps** and **flood management plans** at the basin level & for coastal zones

European Directive on the Assessment and Management of Floods – implementation schedule

Member states will do:

- **By 22.12.2018- 2nd preliminary flood risk assessment & specific requirements on climate change**
- **By 22.12.2019 – 2nd flood hazard maps and flood risk maps By 22.12.2021 – 2nd flood risk management plans & specific requirement on climate change**
- **In international basins:**

➢ **coordination between MS**

➢ problems are not passed from one country to another downstream

➢ all stakeholders must bo given opportunity to participate actively in the development of the flood risk management plans

➢ risk assessments, maps & plans must be available to public

- **These 3 steps are to be repeated on a 6-years cycle**

IMPLEMENTATION EU FLOOD DIRECTIVE IN POLAND

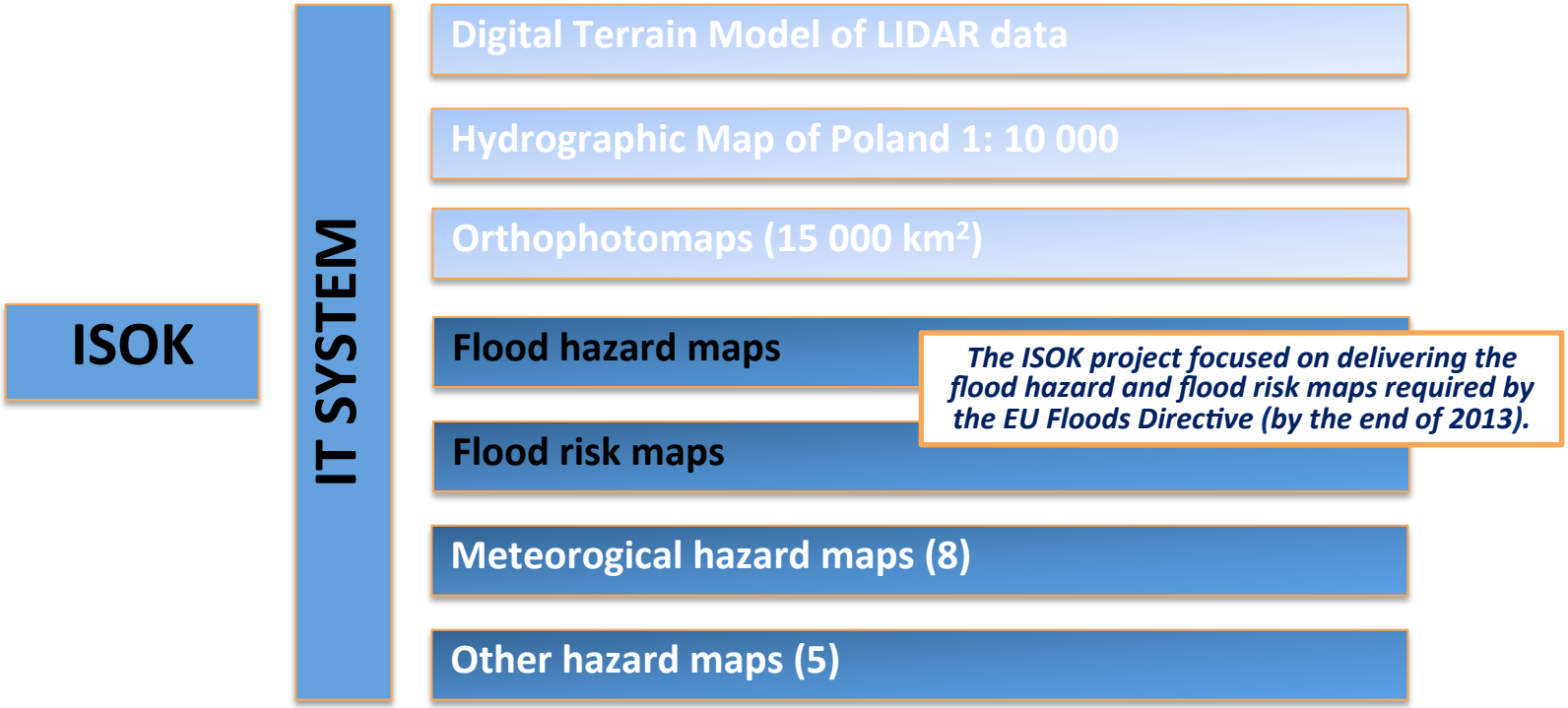
Source: http://ec.europa.eu/environment/water/participation/map_mc/countries/images/poland.jpg

IT System for country protection against extraordinary hazards

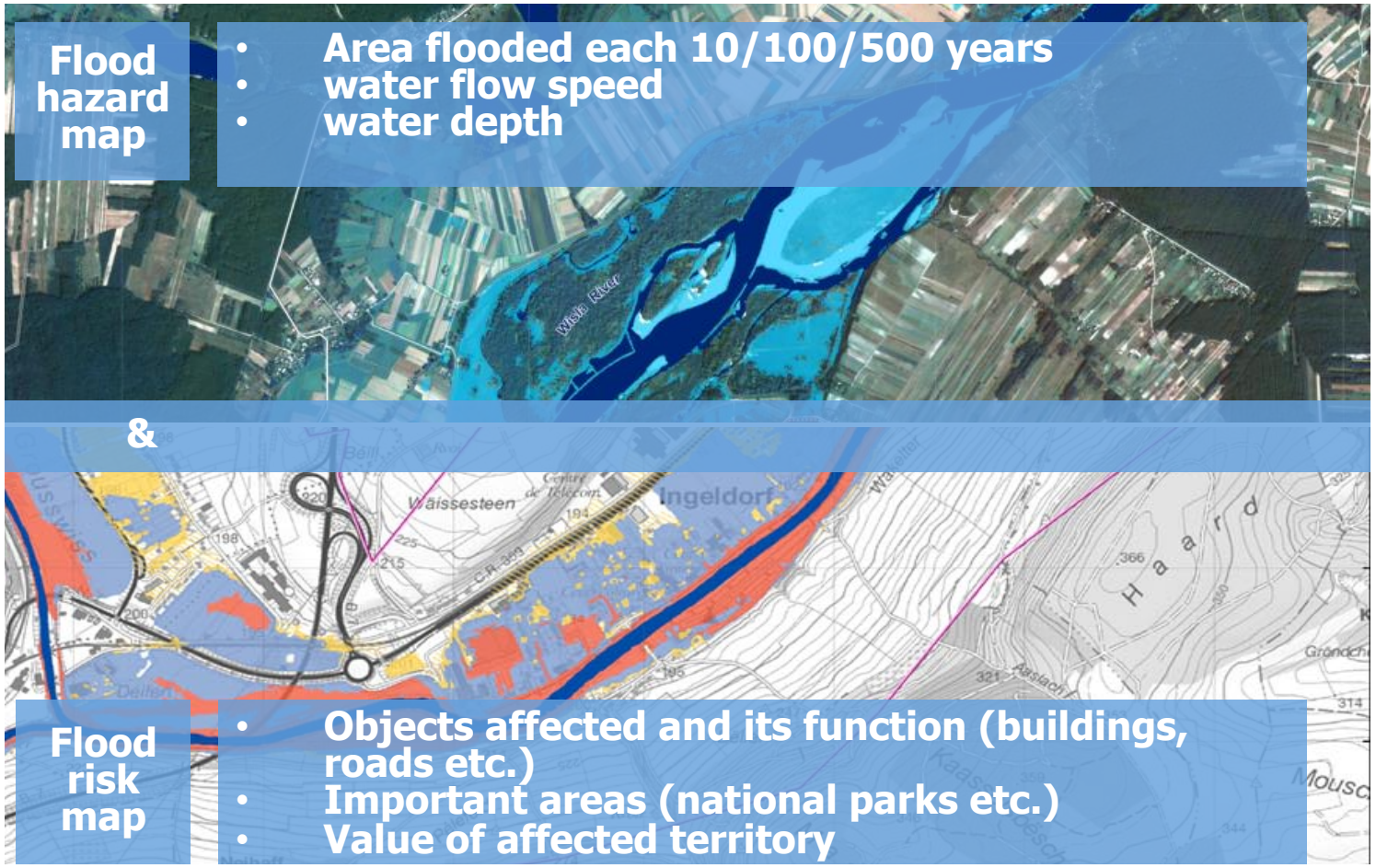
Informatyczny System Osłony Kraju przed nadzwyczajnymi zagrożeniami (ISOK)

75 milllion EURO EU co-financed project

Main components of the ISOK System



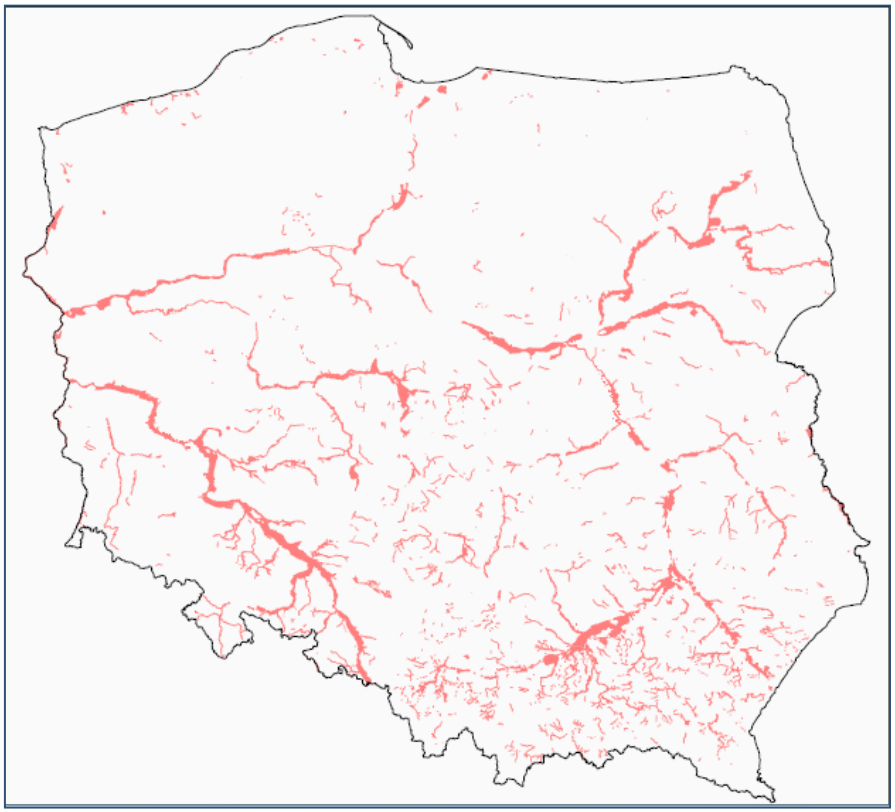
Flood Hazard Maps and Flood Risk Maps – main content



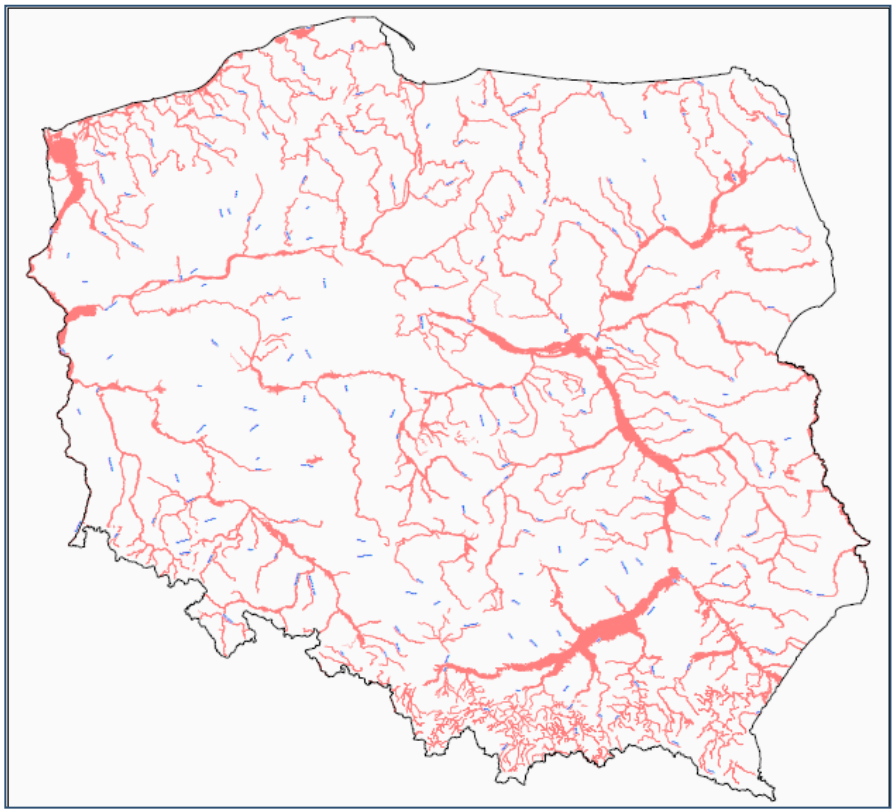
Flood Hazard Maps (FHM) and Flood Risk Maps (FRM) – general methodology

- Preliminary flood risk assessment
- Input data for modeling
  - Airborne Lidar Scanning (ALS) & DTM
  - Cross-section data through flood plain
  - Data concerning river Hydraulic Structures in floodplain
  - Data about surface in floodplain for roughness coefficient calculations
- Hydrology input (probablity distributions, estimation of extreme flows, hypothetical floods) based on long time series and dense enough network of monitoring stations
- Modeling framework (type of model: 1D, 2D, hybrid) & modeling guidelines
- Guidelines for creation of maps (FHR & FRM)

Preliminary flood risk assessment

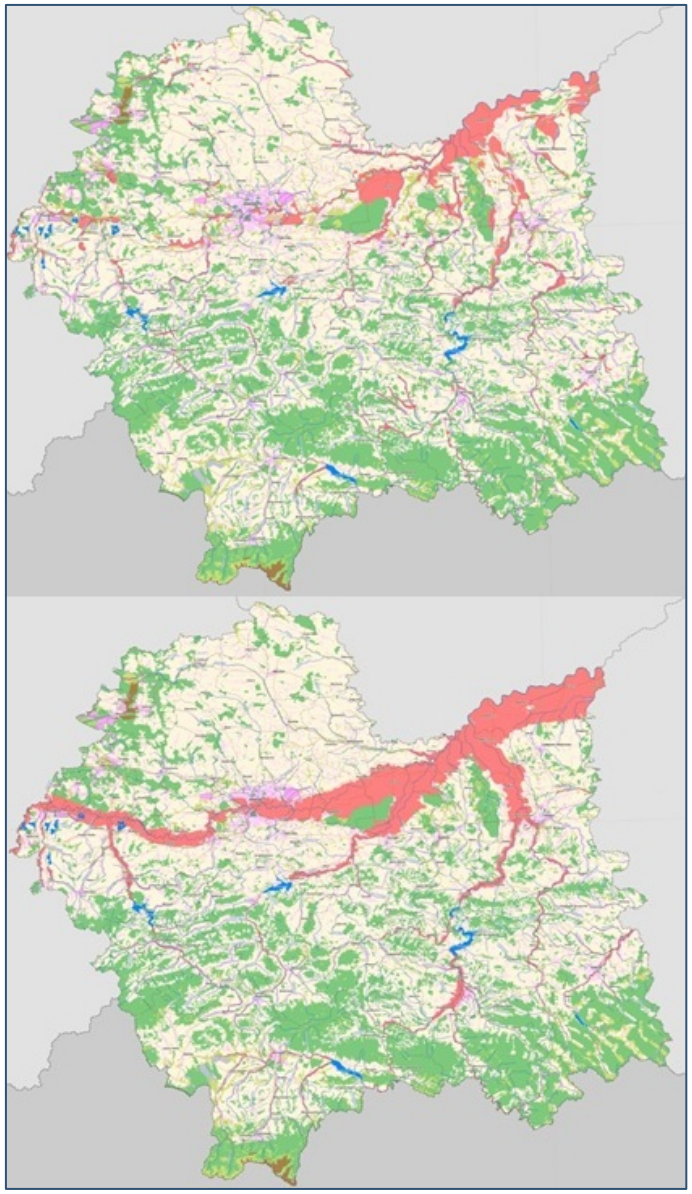


historical floods



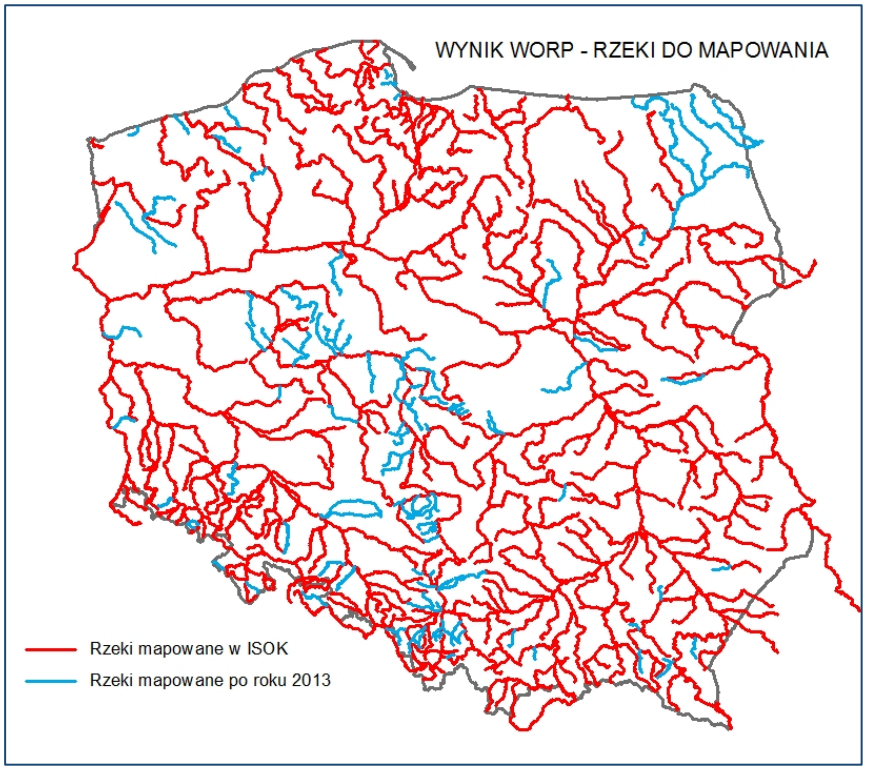
probable floods

Preliminary flood risk assessment



Map of significant historical floods – małopolskie voivodeship

Map of areas where occurrences of floods is probable– małopolskie voivodeship



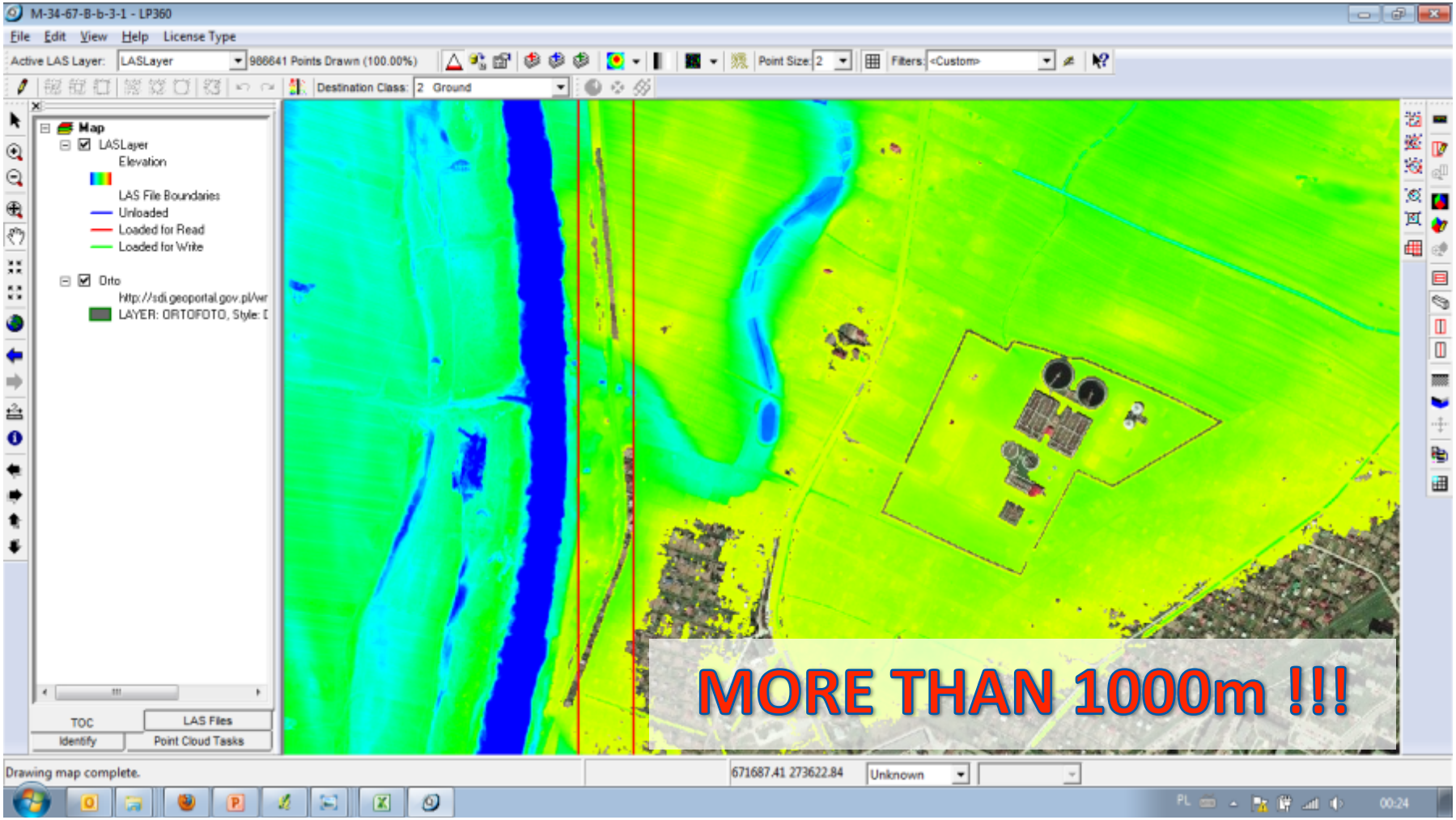
Preliminary flood risk assessment –results:

In total, 839 rivers with a total length of 27 161 km were classified as areas at risk of flooding, of which:

- 253 rivers with a total length of 14 481 km are classified to the development of flood hazard maps and flood risk maps in the 1st planning cycle – finished in 2013

- 583 rivers with a total length of 12 680 km are classified to the development of flood hazard maps and flood risk maps in the 2nd planning cycle – to be finished in 2019

IMPORTANCE OF DTM ACCURACY: flood zone from hydromodeling - OLD DTM (aerial imagery) – 1,5 m RMSE



Wastewater treatment plant - Mielec – cost 7 mln €
OLD DTM (from aerial imagery)

IMPORTANCE OF DTM ACCURACY: flood zone from hydromodeling - NEW ALS DTM – 0,1m RMSE

Wastewater treatment plant - Mielec – cost 7 mln €

FHM & FRM – input data

Digital terrain elevation and surface cover model (DTM)

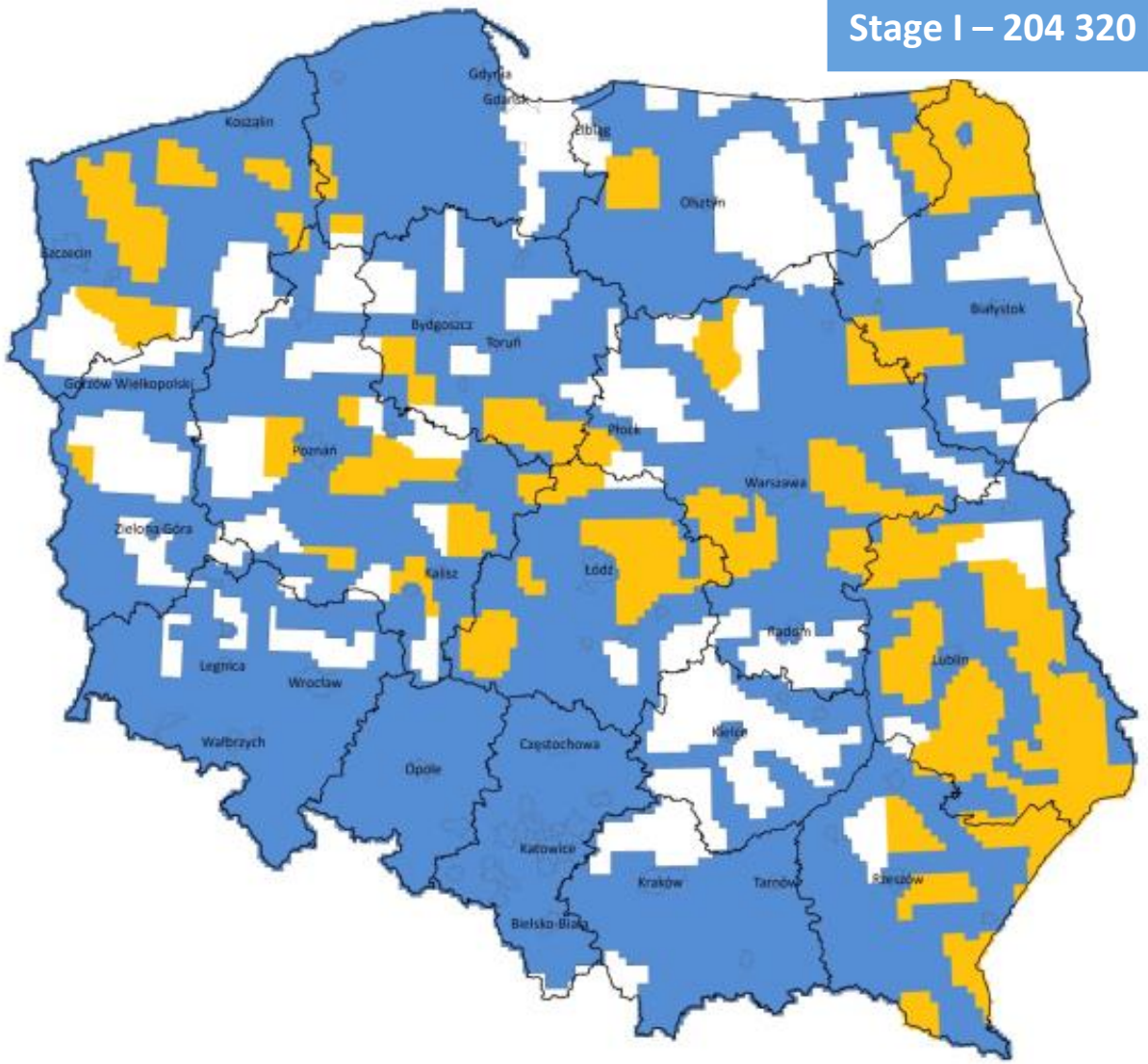
- Elevation data for 204.000 square kilometers of the territory of Poland
- Data obtained by using the method of airborne laser scanning (ALS)
- Point clouds divided within the classification process into:
  - the surface layer, i.e. the layer of the digital terrain elevation model
  - the layer of digital terrain cover model, divided into:
    - ✓ low vegetation
    - ✓ medium vegetation
    - ✓ high vegetation
    - ✓ buildings
    - ✓ 3D models
  - the digital terrain model is one of the key products in the assessment and management of flood risks
  - terrain model supplemented with structural elements (e.g. dikes or engineering constructions) obtained by using the method of direct measurement, by photographmetric methods

ALS – Airborne Laser Scanning

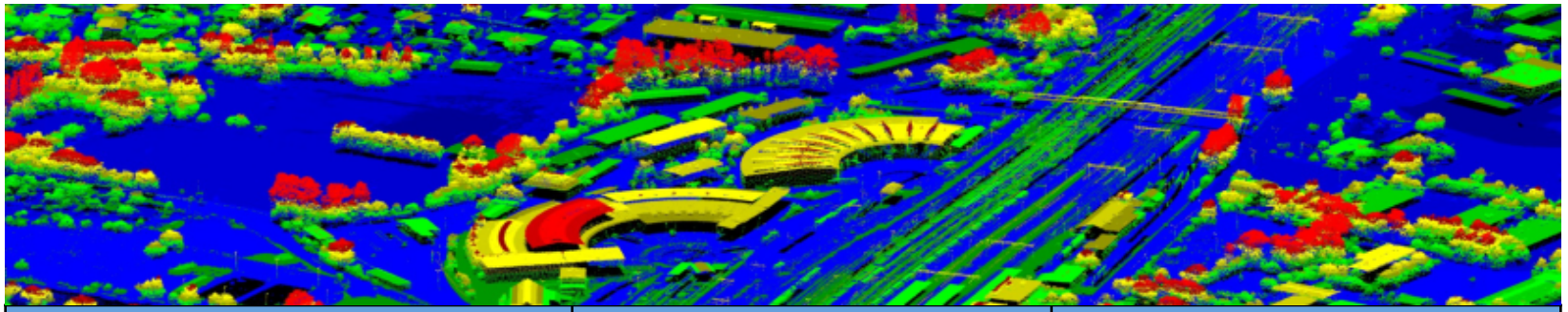
Stage I – 204 320 km²

Stage II – 50 303km²

80% of Poland



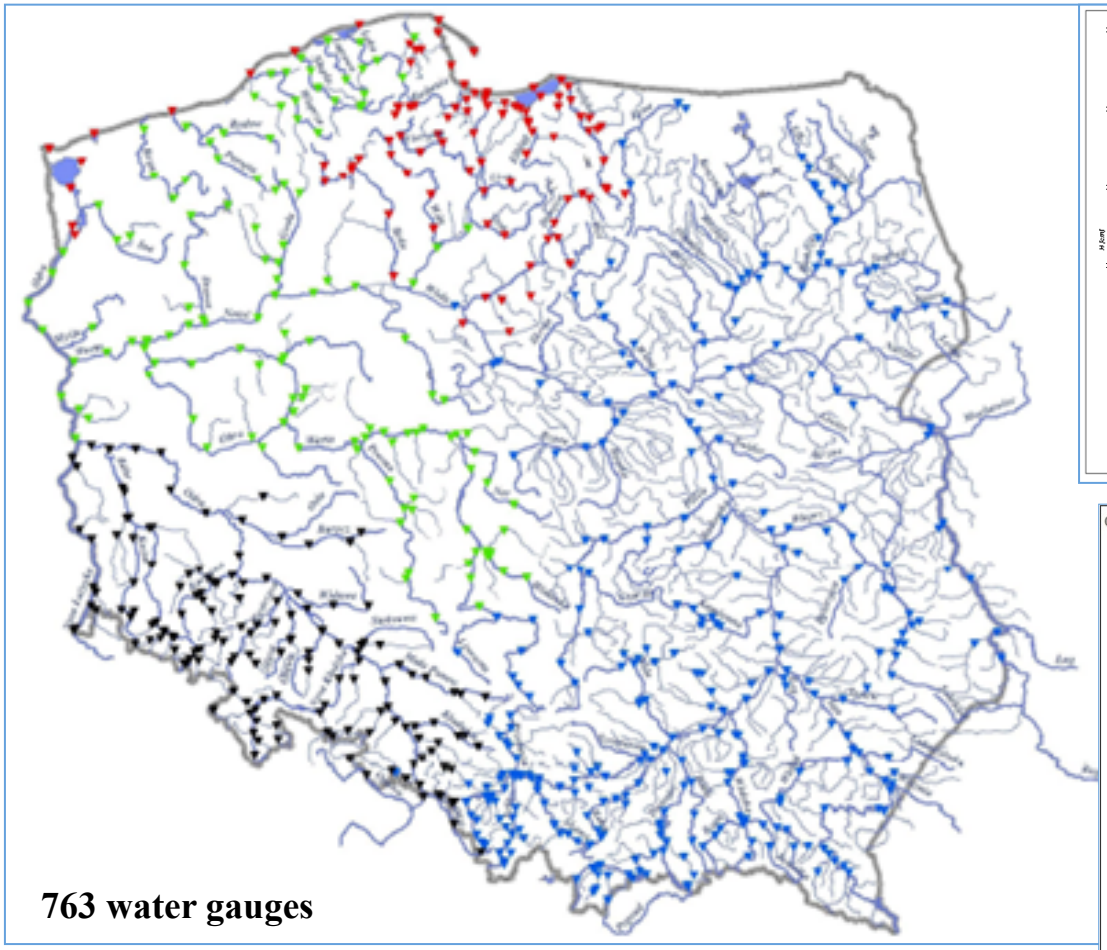
ALS + secondary products

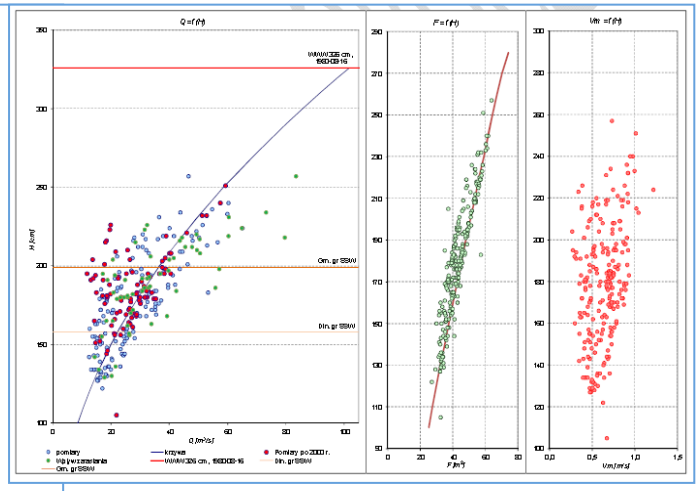


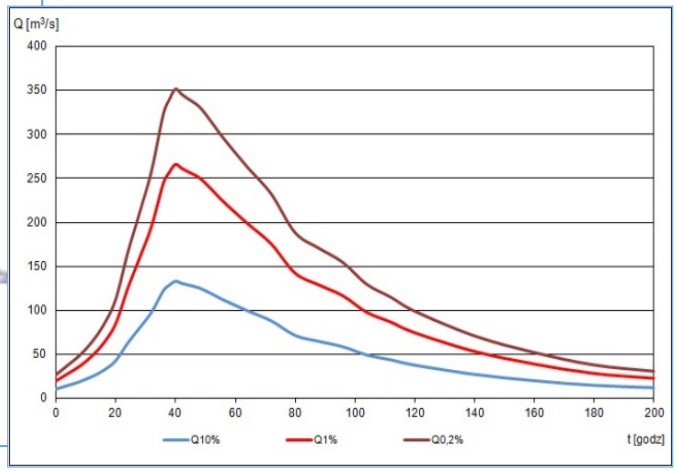
Products	Standard I		Standard II – cities	
204 000 km²	**190 000 km²**		**14 000 km²**	
Point cloud (LAS 1.2)	**1**	**4 p/m²**	**2**	**12 p/m²**
		RMSE 0,15 m		RMSE 0,10 m
		XY_{RMS} 0,5 m		XY_{RMS} 0,4 m
3 DTM (ESRI GRID, ASCII xyz)	**GRID 1m**			
DSM (ESRI GRID, ASCII xyz)	**4 GRID 1m**		**5 GRID 0.5m**	
6 Aerial imagery	**45 cm**		**30 cm**	

FHM & FRM – input data - hydrology

probabilistic distributions, estimation of extreme flows, hypothetical floods







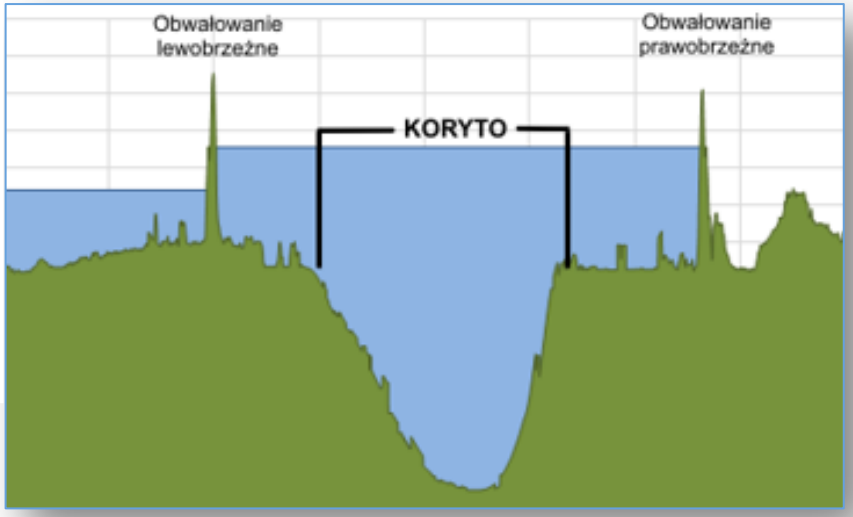
Flood hazard maps – data needed for modeling

Data needed to realize hydrodynamic modelling:

- **Models: 1D, 2D and hybrid 1D/2D**
- **Cross-Section data through flood plain**
- **Land Use factors for points in Cross-Sections (for obtaining roughness factors)**
- **Data concerning river Hydraulic Structures**
- **Hypothetical floods**

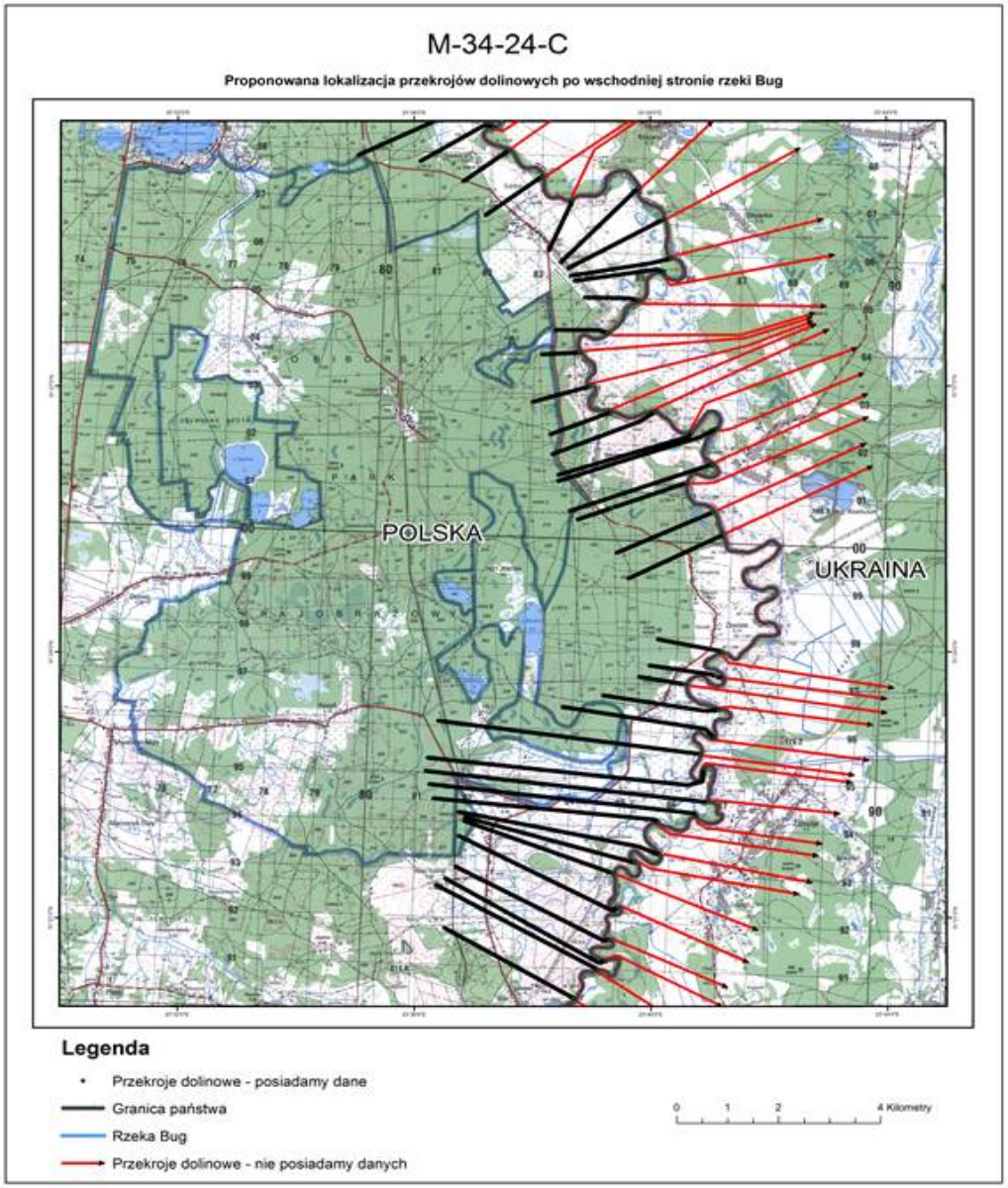
FHM & FRM – input data

Cross-Section data through flood plain



24 523 cross-sections are made

Flood hazard maps for the Bug river – data needed – Cross-Section data through flood plain



Flood hazard maps – data needed – Land use data

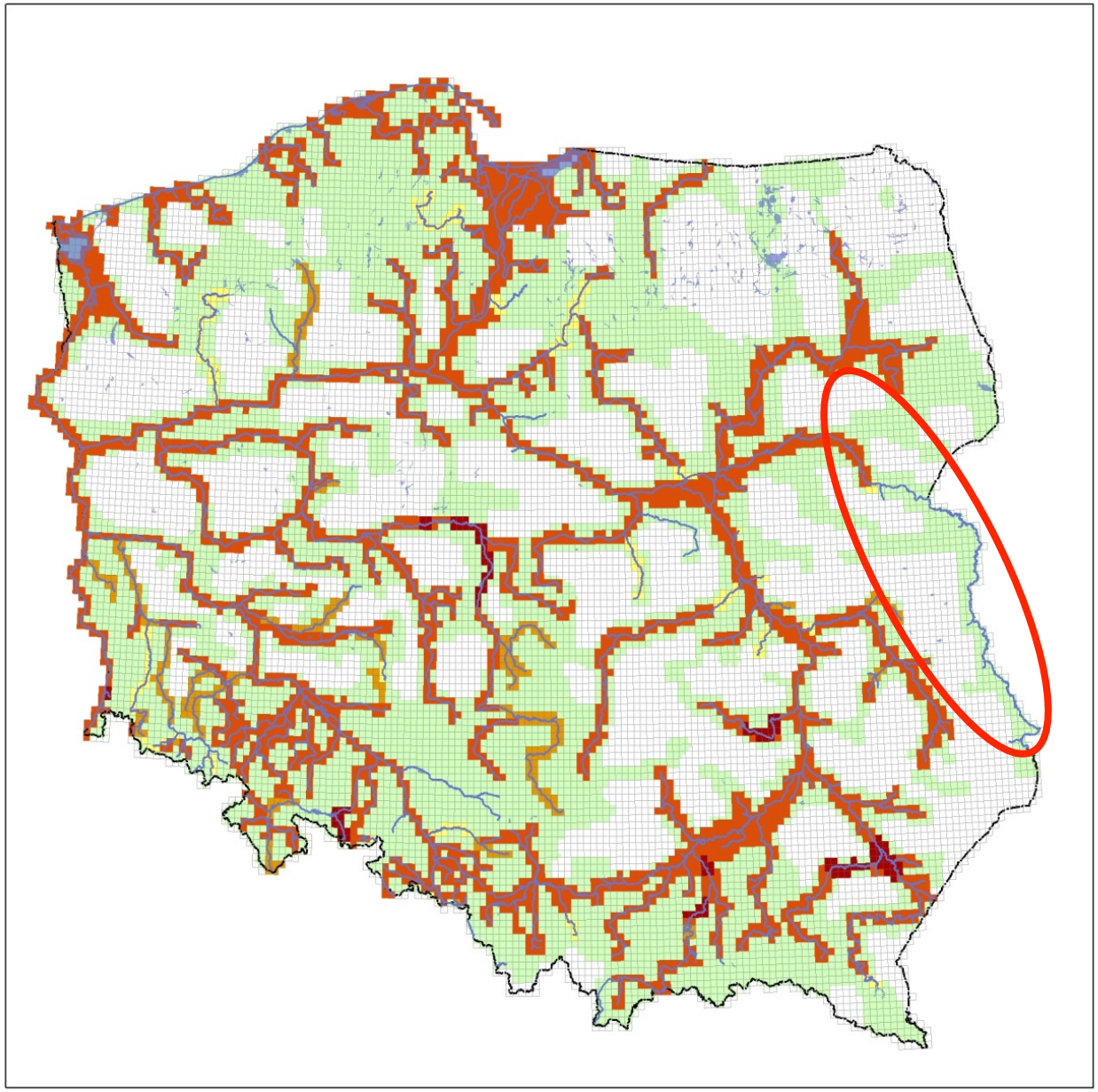
land use information from:

- National Database of Topographic Objects
- Aerial photographs
- Orthophotomaps
- Topographic maps

land use types in analysis:

- Concrete/asphalt
- Gravel/rocks
- Sand
- Grass
- Meadow
- Fallow lands
- Farmland
- Bushes
- Trees
- Woods
- etc.

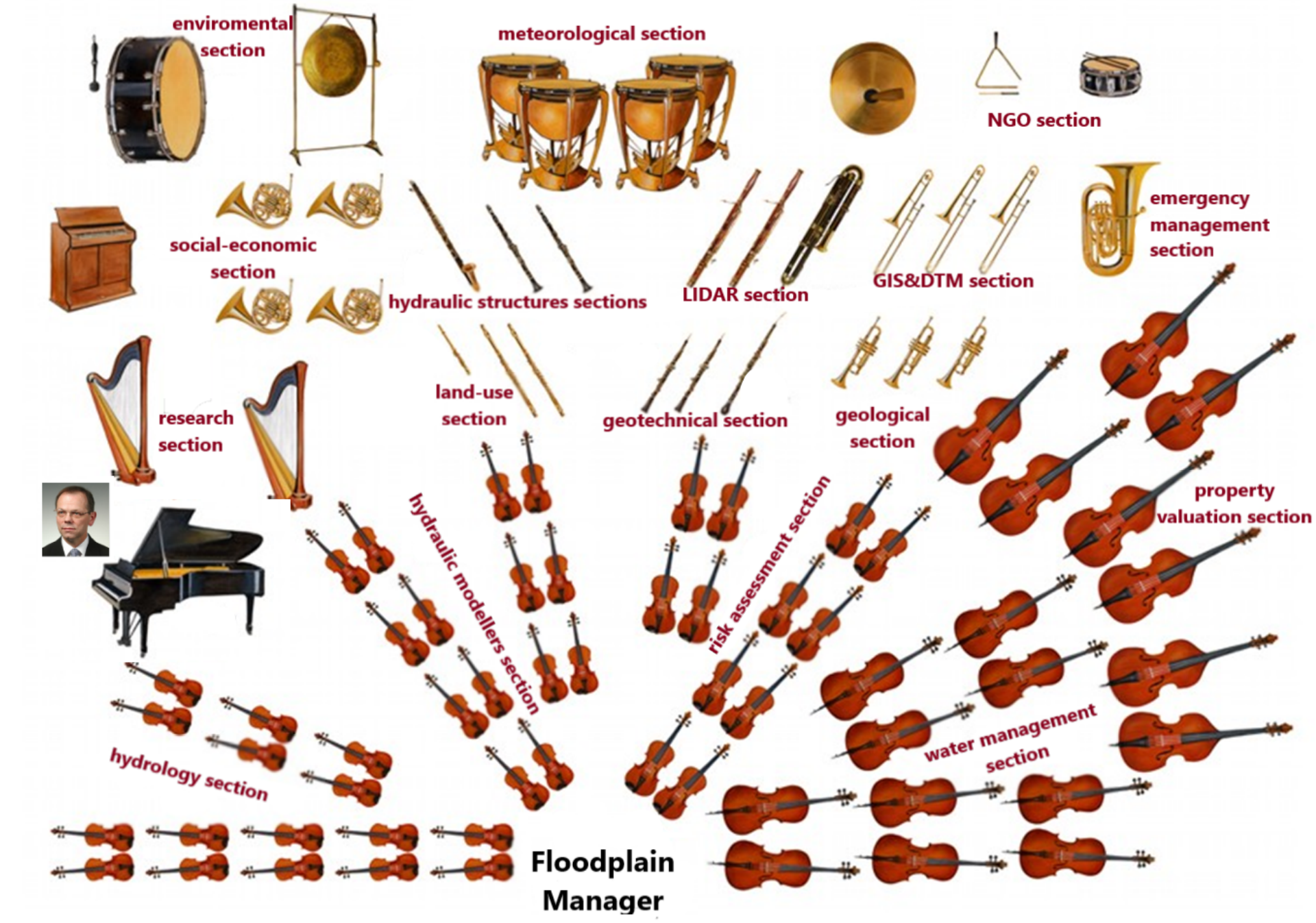
Flood hazard maps coverage for Poland



Lessons learned

- DTM − looks OK based on USGS standards
- Cross-sections − still need for more
- Hydrology − there are still uncontrolled rivers where we do assumptions rather than rely on observations
- Change of probablility distributions is changing flood zones
- Modeling − hypothetical floods assumptions, calibration rules, alternative model to MIKE, 1D versus 2D
- PROBLEMS: dike breaks approach, damage curves

Flood Prevention Orchestra



Thank you for your attention

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WARR